Rediscovering urban intelligence within cities by technologies

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Abstract
As drivers of economic and social growth, and engines of innovation, cities develop urban intelligence relying on the use of information and communication technologies (ICTs) as a source to ensure high quality of life and improve processes and services. Smart cities and smart communities help build urban intelligence within cities aiming to proceed towards urban sustainability and promoting innovation and knowledge creation. Cities identify smart and intelligent solutions to facing and solving urban problems, by using the potential offered by information technology to drive innovative processes and proceed towards sustainable urban growth. Information technology helps cities to rediscover the meaning of community as an organizational framework that fosters collaboration within urban spaces. Local government, business, education and citizens understand the potential of information technology in order to transform the community in significant ways through collaboration. Intelligent cities as communities promote technological innovation and encourage people to work for achieving urban sustainability. As engines of innovation, cities as smart communities proceed towards urban intelligence by developing the urban community as an intelligent city which rediscovers a pathway for growth and knowledge, innovation and value creation.

1. Introduction

Cities use the potential of information technology in order to enable people and communities to develop urban intelligence. As intelligent urban communities, cities develop a smart-enabled vision to urban design. As engines of innovation and knowledge, technology-enabled cities shape a pathway that leads to cities as intelligent urban communities. Intelligent cities emerge as interactive environments where information and communication technologies (ICTs) contribute to creating interactive spaces, bringing together digital, technological, physical and human entities [1].

The aim of this study is to identify the drivers of urban intelligence within cities aiming to proceed towards sustainable urban future and promote social and economic growth. The study relies on literature analysis regarding the main articles concerning the concepts of smart city and smart community as drivers of urban growth and innovation. Cities promote urban economic growth and development, and sustain value creation within society, improving the quality of life. Cities of tomorrow use ICTs and follow a smart city view for driving social and economic development of urban areas in order to achieve successful issues by sustaining processes of innovation and knowledge creation over time [2] [3] [4]. As knowledge-oriented organizations, cities develop and apply knowledge [5], reinforcing

knowledge assets and intellectual infrastructures [6], and encouraging the use of knowledge to achieve social, economic and environmental issues [7].

An intelligent city is a territorial innovation system combining knowledge, cooperation and digital communication to improve the problem-solving capability [8]. As adopting a smart approach to urban development, cities are investing in the design and implementation of a smart city as a vision that helps all the urban stakeholders to transform in a significant way the urban community, and to enhance the social and economic performances of cities. Developing urban intelligence helps social cohesion and development. Today, intelligent cities drive the city as smart and sustainable community promoting urban innovation as a source for growth [9]. The use of information technology helps cities as smart and intelligent communities by strengthening the collaboration among local public institutions, business and citizens for urban innovation and growth [10].

The paper is organized as follows. After introduction, intelligent cities using information technology are presented. In the third paragraph, driving urban intelligence within cities dealing with technology relies on promoting smart cities for urban services and innovation, and developing collaborative processes through smart communities. Finally, discussion and conclusions are outlined.

2. Intelligent cities and information technology

The intelligent city is able to provide high-quality services, promote a social and cultural milieu, develop urban human capital, and enter in networks which enhance urban competitiveness and sustainability. Intelligent or smart cities embed information and communication technologies within urban environments, bringing technology and people together for innovation, learning, knowledge and problem solving [11].

An intelligent city is able to assemble organizational capacity, institutional leadership and creativity to promote innovation to drive competitiveness. An intelligent city is a knowledge-oriented urban community which uses technological innovation and people to increase urban sustainability. In particular ICTs drive the city to behave as an intelligent city by promoting economic development, social and territorial cohesion, people's involvement and mobilization [12]. The intelligent city refers to a connected community which uses knowledge, learning and collective intelligence to drive all members to follow a long-term vision to urban development [1]. Information and digital technology helps to reinvent the city as a community constructing opportunities for developing innovation and collective intelligence [13]. Intelligent cities provide digital collaborative spaces and support the building of collective intelligence, relying on a community or network of organizations and companies [14]. In particular, information technology helps empower the citizen for more intelligent and informed behavior [15].

An intelligent city is able to provide high quality of services to citizens and business, using resource in an efficient way by employing the potential offered by technological innovation [16]. Cities contribute to improving the quality of life by driving urban innovation and sustainability identifying a smart vision relying on ICT-intelligence as a source that helps strengthen urban local capacity and development [17]. Intelligent cities contribute to

developing urban sustainability [18] and building environments for innovation as a source for urban development, value creation and generation of knowledge [14]. Cities promote a smart vision dealing with intelligence as a source that enables smartness and future [19].

Today, intelligent cities follow an innovation-oriented pathway becoming smart and sustainable communities, promoting synergies and teamwork between technologies, knowledge and skills by developing collaboration among organisations within community, promoting innovative solutions to make more efficient cities and more competitive urban innovation ecosystems [9].

Technology helps to empower communities to better live and drive the development of knowledge and innovation for urban development and growth. Smart cities support collective learning processes and urban intelligence that enable urban change and innovation coherently with a long-term horizon for urban growth [20]. Cities contribute to knowledge and enhance processes in order to develop human and cultural resources, developing intelligent communities that enable the creation of environments that contribute to improving cognitive skills for learning and innovation [8]. Cities evolve as smart, intelligent and inclusive communities in order to achieve sustainability as a source for continuous and change. Urban innovation relies on city's intelligence as collaborative frameworks that enables citizens, companies and public authorities to work for innovation through digital spaces [1].

3. How to drive urban intelligence within cities dealing with technology

Technology enables cities to become smart urban communities bringing together technological, human, organizational, knowledge and social aspects. Information technology helps to rediscover the city as smart and intelligent community as co-producer of value by involving all the relevant stakeholders for participatory, interactive and information-based urban environments. In particular, the interrelation between smart city and smart community concepts helps us understand how to contribute to new forms of urban intelligence and which are the drivers of urban intelligence. As engines of innovation and technology-enabled communities, cities contribute to shaping collective intelligence in terms of capacity to co-operate in creation, innovation, invention through the exchange of knowledge [18]. While an intelligent city is a thinking community designing frameworks to achieve solutions, a smart city refers to the ways by which to use some devices and implement processes [16].

3.1 Promoting smart cities as a vision for urban quality of life and innovation

There are several definitions about the concept of smart city. Smart city initiatives lead cities to designing an urban environment open to using the potential of information technology to improve citizen-oriented services, support the community development and enhance the efforts to ensure high quality of life. Smart city helps use technology in everyday urban life to develop smartness in urban activities and environments [21]. Smart city utilizes technologies to improve city performance and quality of services to citizens [22].

A smart city refers to collaboration among local government officials, citizens and other stakeholders to make the city a better place for life [23]. Cities behave as smart cities by seeking to address public issues via ICT-based solutions approaching a multi-stakeholder, municipally based partnership [24]. A smart city helps enhance the city's human, collective, and technological capital for increasing urban sustainability [25], integrating technologies, systems, services and capabilities. Cities select a smart approach to rethinking city design future, promoting smartness as a vision that enables the city to modernize urban services and infrastructures employing ICTs. The use of information technology helps to build smart and intelligent urban communities for participatory, interactive and information-based urban environments [10].

As engines and drivers of social and economic change, cities of tomorrow as smart communities use ICTs driving economic and social growth and developing continuous innovation [26], strengthening community intelligence for innovation [27]. Smart cities contribute to open innovation in terms of co-production and co-delivery of services and policies as well [3]. Technologies lead to smarter cities which facilitate collaborative processes, strengthening the capacities and needs of communities [28]. Cities of the future will be smart communities in the knowledge-based economies playing a central role for improving the competitiveness of the urban system [29]. Sustaining smart growth relies on smart cities and communities promoting innovation processes [30], encouraging multi-level and sector interactions between private and public organizations for co-creation, co-design and co-implementation of innovative solutions [26].

The smart city concept is a driver of urban sustainability and quality of life improvement through investments in human, technological and social capital and communication [31]. Cities advance in ICTs, adopt a smart strategy to urban development to improve urban managerial efficiency and quality of life [2]. Cities invest in smart solutions achieving sustainable development in urban spaces through efficient use of resources, competitive knowledge, and innovation-led economy [32]. Community, technology and policy drive smart city as sustainable, livable, productive and accessible cities [33]. Smart cities advance towards sustainable urban development, improving and extending the wealth of people within a community [34].

3.2 Developing the community and collaborative processes through smart communities

Information technology helps cities to rediscover and enhance the concept of community. A smart city refers to a community which uses technology to ensure service for high quality of life and wellbeing of it citizens [35]. City is a smart community in which local government, business, education and citizens understand the potential of information technology as a source to transform the community in significant ways through collaboration [36]. Cities will be smart, inclusive and sustainable communities for life, work and business [9]. The use of information technology helps to rediscover the community development. Smart city initiatives contribute to fostering the aspect related to reinforcing the urban community [27]. Smart city initiatives provide tools and sources to make the city as an intelligent community. Smart communities support innovation, citizen-centricity, knowledge and sustainability. While smart cities emphasize embedded systems, sensors and interactive media for knowledge diffusion and interaction, intelligent cities

contribute to innovation and web-based collaborative spaces and systems, by integrating physical, institutional and digital dimension [27]. Sustaining smart growth relies on cities as smart communities that help promote economic development, job growth and sustain high and increased quality of life [9]. Smart community is likely to uplift citizen satisfaction and wellbeing [22]. As smart communities, cities design digital platforms and services to enable data sharing and processing, information and knowledge, involving citizens to solve problem, to support business and facilitate public life [37]. In an information age, cities as smart communities are embracing a clear vision that enables citizen engagement and mobilises organisational and human energies to drive urban intelligent growth. Public organizations and companies collaborate by developing and managing knowledge, following a shared vision for long-term development of smart cities and growth in urban communities [38].

The future and sustainability of cities rely on smart communities fostering knowledge-based processes and infrastructures to drive social and economic development urban ecosystems [19]. Rethinking cities as smart communities helps empowering citizens as co-designers and co-producers of public services [39]. Cities are smart communities and better places promoting sustainable wellbeing for people [40] and building a shared governance relying on participation, dialogue and open debate among all the stakeholders for urban policy options [9]. Cities as smart communities adopt a human-centered vision to developing democratic and cooperative urban innovation, promoting collaborative decision-making processes [41]. Cities build an urban community by involving people to live and design the city, creating meanings, believing in values, achieving goals coherently with driving the cities towards an urban growth. Smart communities help to connect public and private organizations, groups and citizens to promote specific local services and advance collective skills [42]. Smart city performances rely on considering the community involved in urban value creation (the civil society, industry, universities, government) by strengthening participation, network, expertise in urban planning and development [43].

4. Discussion and conclusions

Intelligent cities contribute to developing knowledge, sustainability and innovation as assets that lead cities as communities living in the future and promoting urban development. Information technology helps cities to modernize processes and services in order to achieve urban sustainability over time. Information technology helps support urban intelligence creation within cities and communities. Even if terms smart community and smart city seem to be overlapping concepts, the *smart* as related to city and community assume different meanings and contribute to qualifying the drivers of urban intelligence within the city. The *Smart* is both a vision and means to drive the city into the future. Cities invest in innovation, knowledge and technology in order to open to new forms of intelligence that enhance the urban development. As shown in the figure 1, a framework of analysis is proposed in order to identify a pathway leading to intelligent cities and communities.

Table 1 – Towards intelligent cities and communities: a framework

from services	to innovation	
Smart Cities	Innovation-oriented Cities	from users
Smart Communities	Cities as Intelligent Communities	to community
from technologies	to collaboration	

Information technology helps cities to develop services and promote innovation. Smart city vision is leading to smart and sustainable urban development. Technology enables cities to develop and experiment new forms of urban intelligence. While technologies contribute to improving services, innovation relates to intelligence as both an issue and driver. Smart cities use the potential of information technology to enable the users for new services. Smart communities use information technology as a platform for involving all urban stakeholders to promote cooperative processes for urban value creation. As engines of innovation, cities as smart communities proceed towards urban intelligence by developing the intelligent urban community which rediscovers sources for inclusive and sustainable development and growth, and creates knowledge for innovation and value creation.

The study has organizational, social and managerial implications. Cities employ human and technological resources to achieve urban value creation by investing in collaborative processes. Urban social sustainability helps cities developing a framework for intelligent solutions to urban development. City government, business, research centres, associations, citizens construct new forms of collaboration and management to drive the processes of social and organisational inclusion. There are some limitations. The study provides only a theoretical analysis. There are no case studies and empirical research. Further research implies to investigate how Italian cities are developing urban intelligence and sustainability by employing the potential offered by information technology.

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